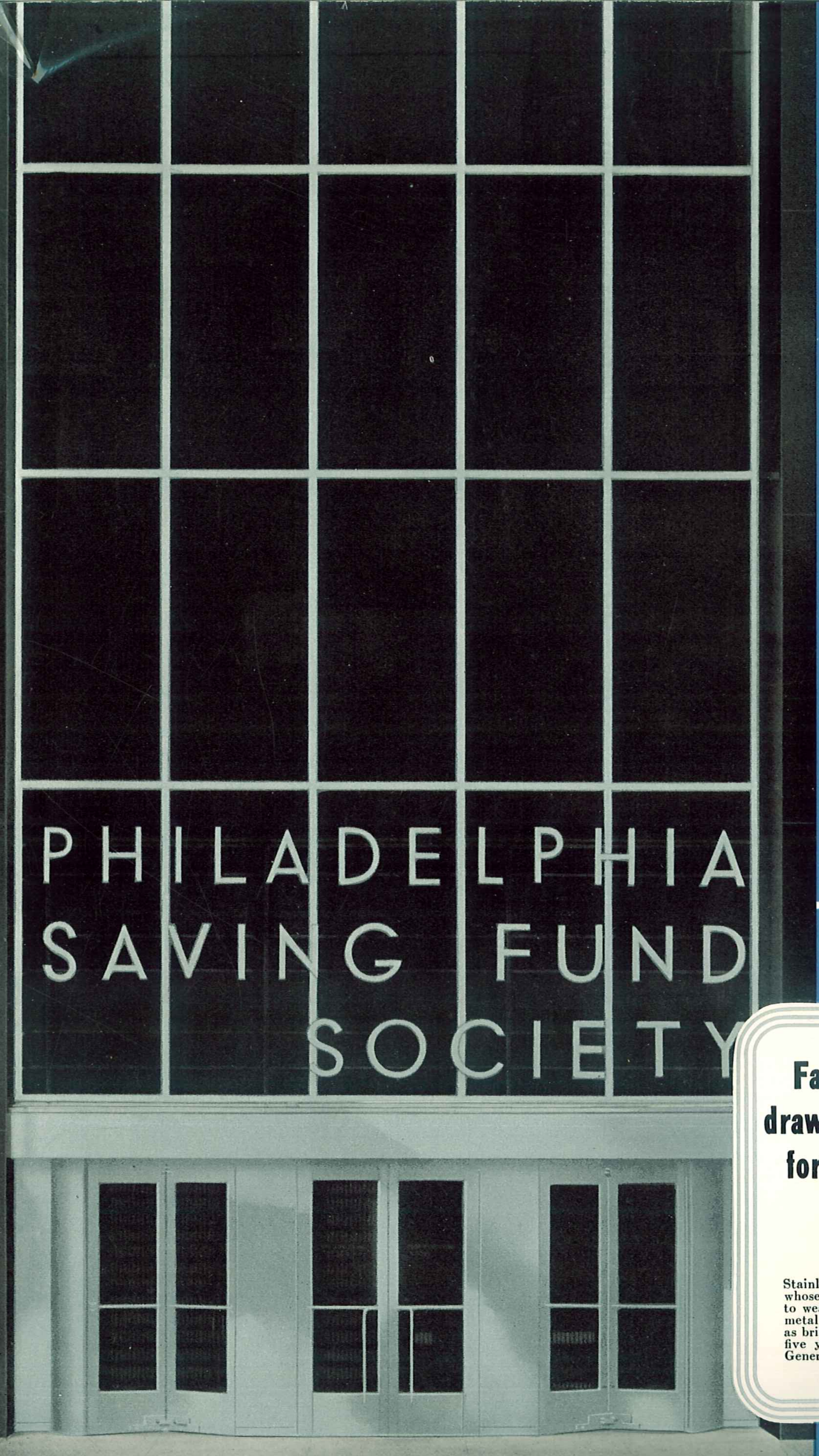
USS

STAINLESS STEELS *in Architecture*

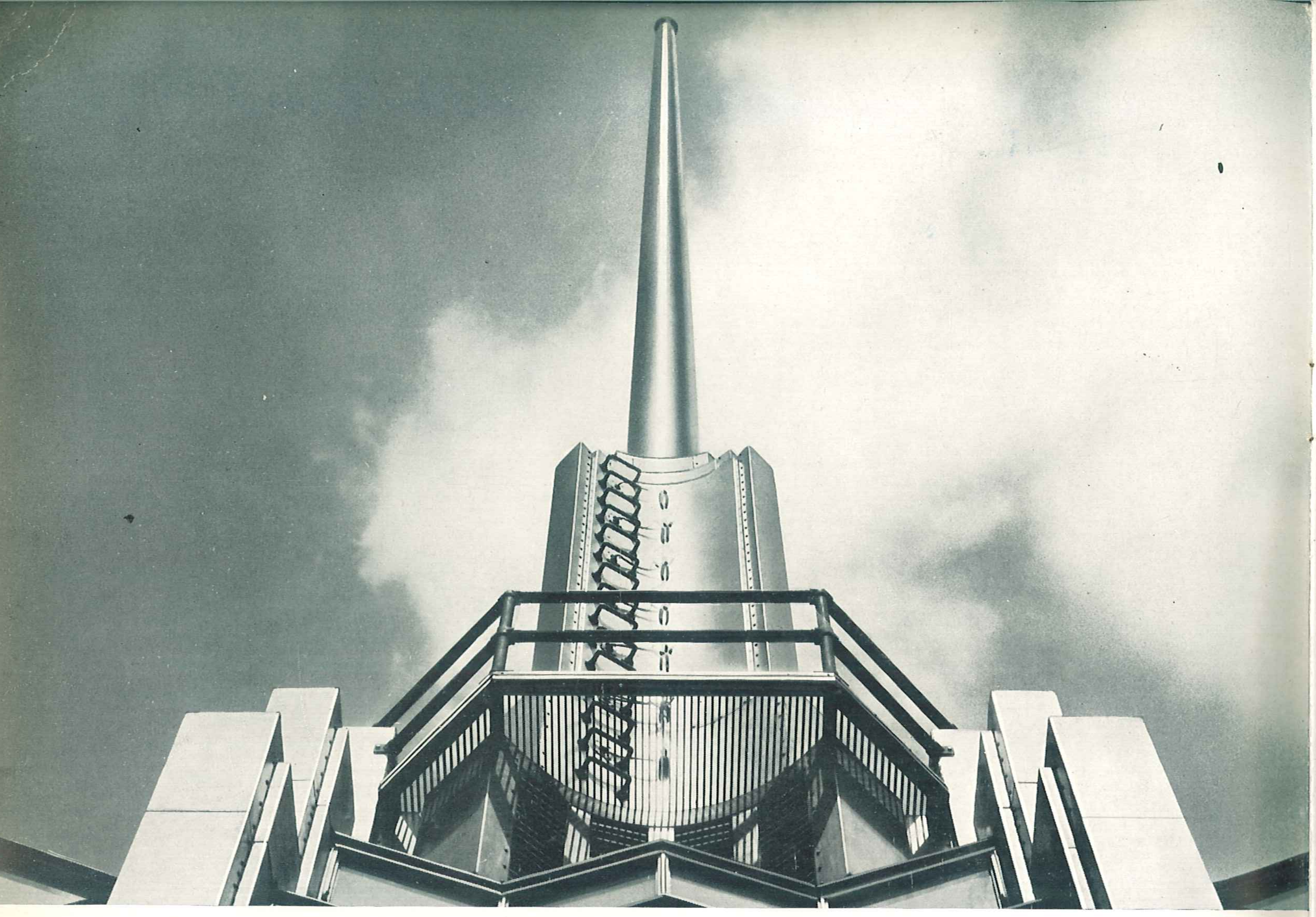


Facts, photographs and drawings specially prepared for the ARCHITECT and his fabricator

●

Stainless steel (18-8) is the only commercial metal whose surface, like glass, is permanently impervious to weather. Had the architect specified any other metal for this impressive entrance, it would not be as brilliantly "new" today as when it was installed five years ago. (Howe and Lescaze, Architects. General Bronze Corp., Fabricators. See page 6.)

UNITED STATES STEEL



This NEW metal . . . with NEW properties *brings NEW opportunities to the architect*

THE architect is a creator. That which he creates is intrinsically an idea—a plan for a brighter kitchen, a skillful arrangement to attract traffic into stores, a beautiful, practical, yet strictly functional building. To give his idea physical reality, he is dependent on certain materials which are available to him. But the limited physical properties of these available materials unfortunately impose inescapable limitations on his freedom to design, to create as he chooses.

For centuries the architect was dependent largely on stone. Because stone offered him no strength in tension his columns had to be thick, his arches had to be massive.

Today, the architect is dependent largely on metals which corrode. Because there will be a steady loss of metal his beams, columns, plates and sheets must be specified much thicker than his design actually requires. Because these metals tarnish, he must ordinarily avoid the use of large, exposed metal surfaces.

That's why USS Stainless Steel is important to the architect. Not because it is merely another metal—but because it offers him an important new range of physical properties. For the first time, USS Stainless Steel makes available to the architect a brilliant commercial metal with (1) complete immunity to atmospheric corrosion, (2) tensile strengths several times greater than mild steel, (3) effective heat resistance up to 1600°–2100° F., and (4) a beautiful variety of splendid finishes ranging from a high polish to glowing satin.

These new properties open new opportunities to obtain new effects, give the architect new freedom to design as he pleases. Four of the most important ways in which architects are already using USS Stainless Steel are illustrated on the following pages—new freedom in modern decoration on pages 8 and 9; attractive store fronts and entrances on pages 10 and 11; brilliant new food and beverage equipment to whet appetites on page 12; and utilitarian applications (hardware, etc.) on page 5. Other interesting possibilities are still relatively undeveloped, such as lightweight, high-strength structures of USS Stainless Steel which could be used to lighten heavy marquees, hangings, towers and roof structures (see suggestion page 4).

If you should have any questions about the properties or uses of USS Stainless Steel which are not answered to your satisfaction in this booklet, please write or call our nearest district office.

Important Facts about USS STAINLESS STEEL

WHAT IS USS STAINLESS STEEL?

The term "stainless steel" identifies a group of alloys of iron, chromium and usually nickel, together with small amounts of other elements. These alloys are characterized by an amazingly high tensile strength combined with excellent resistance both to corrosion and to heat. USS 18-8, in fact, may be said to approach "the perfect metal" for architectural applications in that it is *permanent;* it effectively resists all the destructive forces of nature—stress, corrosion, heat, wear, and time itself.

The initials "USS" identify stainless steels of accurate composition and carefully controlled heat-treatment, made and sold by the world's largest producers of high grade steels, the subsidiary companies of the United States Steel Corporation.

WHICH ANALYSES ARE RECOMMENDED FOR ARCHITECTURAL PURPOSES?

USS 18-8 (containing approx. 18% Cr and 8% Ni) is recommended for all architectural applications. This analysis is completely immune to weather, to a wide variety of corrosive agents, and has highly satisfactory physical properties for all structural applications (see p. 14). USS 17 (approx. 17% Cr) is satisfactory for interior applications where exposure is not severe and cost-reduction an important consideration. It is available in the same finishes, shapes and sizes as USS 18-8.

CAN USS STAINLESS STEEL READILY BE FABRICATED?

Experienced architectural fabricators are now thoroughly familiar with the properties of USS Stainless Steels, and are in a position to fabricate these metals at reasonable cost by virtually every artifice of the metal worker—welding, soldering, sawing, grinding, polishing, drilling, bending, deep drawing, rolling, etc. Extruded shapes alone are not available.

WHERE TO FIND THE FACTS YOU WANT

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WHY IS USS STAINLESS STEEL IMPORTANT TO ARCHITECTS?

To architects, USS Stainless Steel brings three important new properties not hitherto available in any commercial metal—properties which the architect may use to create more beautiful designs, more attractive buildings, more tempting fountains, restaurants, bars, etc.; and to reduce the cost of building operation (cleaning, replacements and repairs). These properties are:

1. CORROSION RESISTANCE

USS 18-8, like glass, is completely impervious to atmospheric corrosion; and like glass, it needs merely a quick wash with soap and water to remove surface soil and restore its original brilliancy. Costly, laborious polishing is never needed . . . and since there can be virtually no loss of metal, there is no known limit to the useful life of USS 18-8.

2. HIGH TENSILE STRENGTH

Even in the annealed condition, USS Stainless Steels have a tensile strength (85,000 lb/in^2) about twice that of ordinary steel. By cold working the tensile strength of USS 18-8 can be increased to 180,000 in sheets and strip; 300,000 and more in various thin sections and wire.

3. BEAUTY

USS Stainless Steels are easily finished in a variety of splendid lusters ranging from glowing satin to high polish; they may be etched, tooled, sculptured and enameled.

HOW ABOUT AVAILABILITY?

USS Stainless Steel is available in all the common metal forms (sheets, bars, tubes, strip, wire, plates and rolled sections) and in such a wide range of dimensions that practically any desired structure can easily be fabricated. It is normally available for immediate delivery from jobber's stocks.

HOW CAN USS STAINLESS STEEL REDUCE EXPENSES, SAVE MONEY?

While the cost-per-pound of USS Stainless Steel falls in the same range as that of other so-called "white metals", that is by no means a true measure of its real cost. In the first place, owing to its exceptional toughness and high tensile strength, it is often possible to use lighter sections of USS Stainless Steel which means that there are fewer pounds of metal to buy. Much more important, however, is the fact that the first cost of USS Stainless Steel is virtually the last —there should never be any further expense for repairs, for replacements nor for polishing.

If you take account of all the factors of expense over the life of your building, you will find that for many uses USS Stainless Steel is actually the least expensive metal you can use.

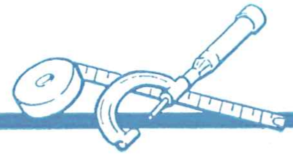
CAN USS STAINLESS STEEL EVER RUST?

Architects who specify that their work shall be executed in USS Stainless Steel have the satisfaction of knowing that it will be immune to atmospheric corrosion . . . that it will never be marred by either rust or tarnish. In and on thousands of buildings USS Stainless Steels are today demonstrating their permanent beauty.

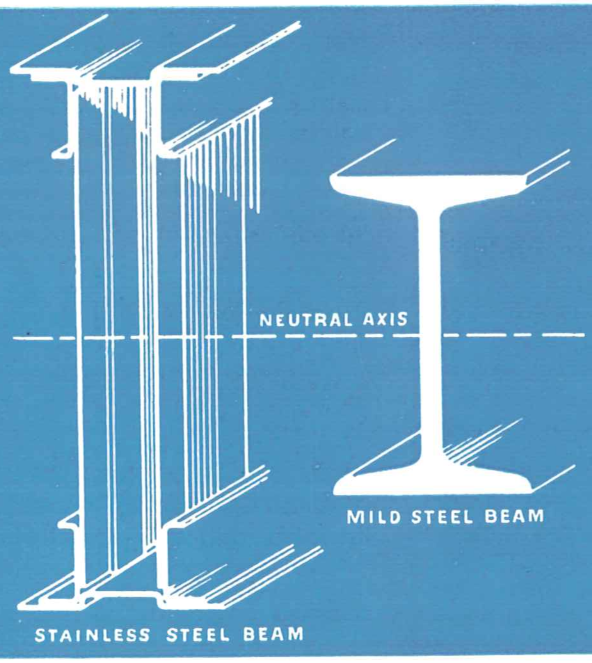
HOW CAN ARCHITECTS BENEFIT THROUGH OUR CONSULTING SERVICE?

Architects will find a competent, resourceful stainless steel specialist in our principal district offices. For more involved problems, these men have access to our special Stainless Steel laboratories where skilled metallurgists and the most advanced laboratory facilities are available to study any problem for which the answer is not already known.

Architects are invited to consult with these men freely and without obligation. They are authorities of wide experience who often can suggest new ideas from other applications. It is their policy to give you sound technical recommendations as free as possible from commercial bias.



LIGHT-WEIGHT CONSTRUCTION



HERE IS A STRENGTH - WEIGHT RATIO OF 10 TO 1

STAINLESS STEEL BEAM		MILD STEEL BEAM	
Moment of Inertia	12.20 in.^{4}	Moment of Inertia	12.10 in.^{4}
Area	1.08 in.^{2}	Area	2.87 in.^{2}
Pounds per foot	3.80 lbs.	Pounds per foot	10.00 lbs.

SINCE the engineer knows in advance that there can be no loss of metal by corrosion, he is free to use thin members of USS Stainless Steel extending further from the neutral axis. The result—a greater moment of inertia per unit area and a light-weight *closed* section of tremendous strength. Although the allowable maximum fiber stress is in the ratio of 4-to-1, these more efficient sections make possible strength-weight ratios of 10-to-1 and more!

Both high tensile strength *and* immunity to atmospheric corrosion are essential to this modern light-weight design . . . and USS Stainless Steel has them both.

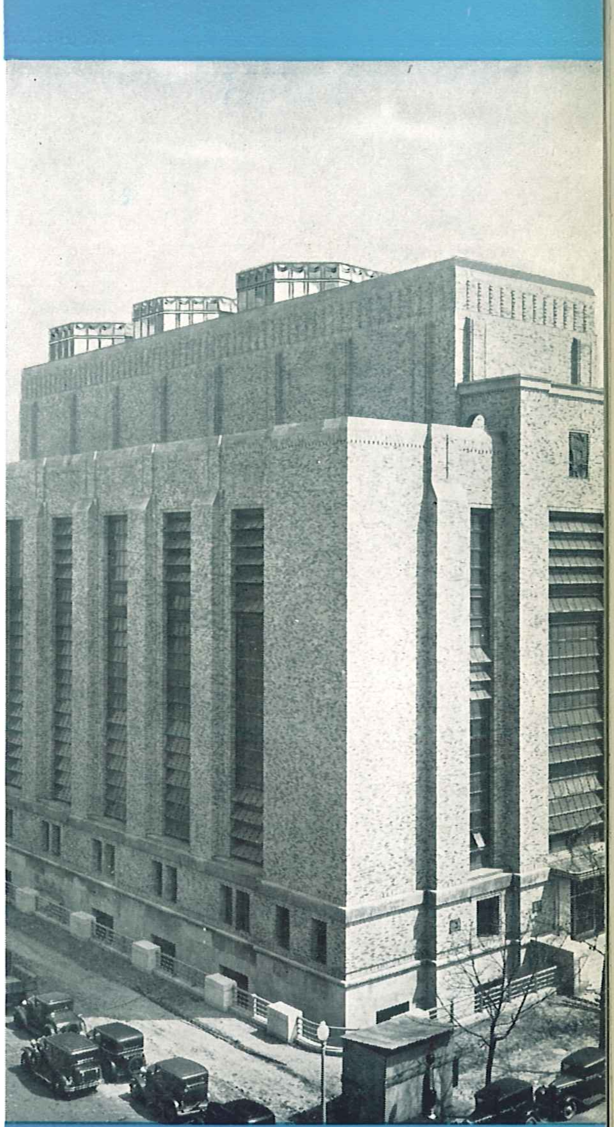
These two beam sections illustrate the principles of the "Budd System of Light-Weight Construction" which made possible the famous stainless steel Zephyr trains. This high-strength, light-weight construction offers interesting possibilities for strong, light-weight marquees, canopies, towers and subsequently added roof structures where weight reduction will permit important savings. Drawings and data from Edw. G. Budd Mfg. Co's. "The Conquest of Weight".

For UTILITY and ECONOMY

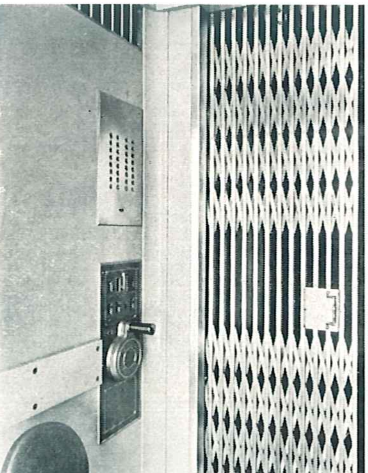
USS STAINLESS STEEL

FOR HARDWARE, VENTILATOR PARTS, EXPOSED TRIMMING, Etc.

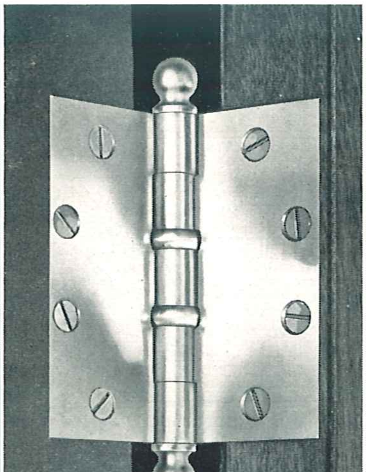
IN THE years to come architects will undoubtedly value USS Stainless Steel as much for its utility and economy as for its beauty and splendor. No metal could be more practical than USS Stainless Steel, because no other metal is so easy to clean and to keep clean, so free from corrosion and pitting, so suitable for roofing and towers inaccessible for cleaning and inspection. And figured over the life of a building, USS Stainless Steel is for many uses the least expensive choice of metal if you take account of its unlimited life, the money saved in eliminating polishing, replacements and repairs.



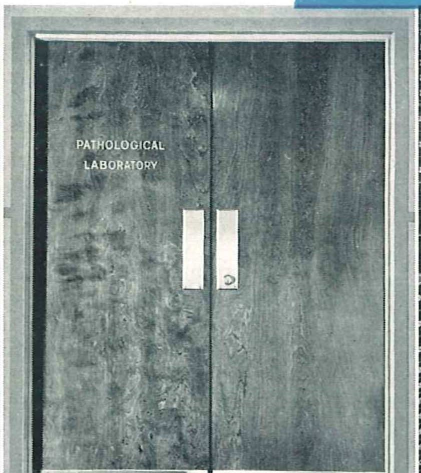
Octagonal stack screens on the Central Heating Plant in Washington are made of heat-resisting, corrosion-resisting USS Stainless Steel.



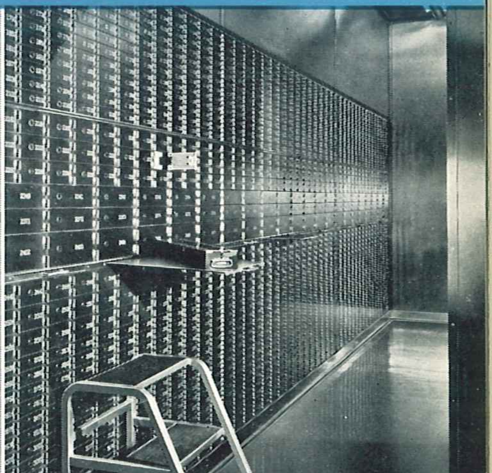
The only way to insure permanent brilliance in parts which are difficult to polish (like elevator gates) is to specify USS Stainless Steel.



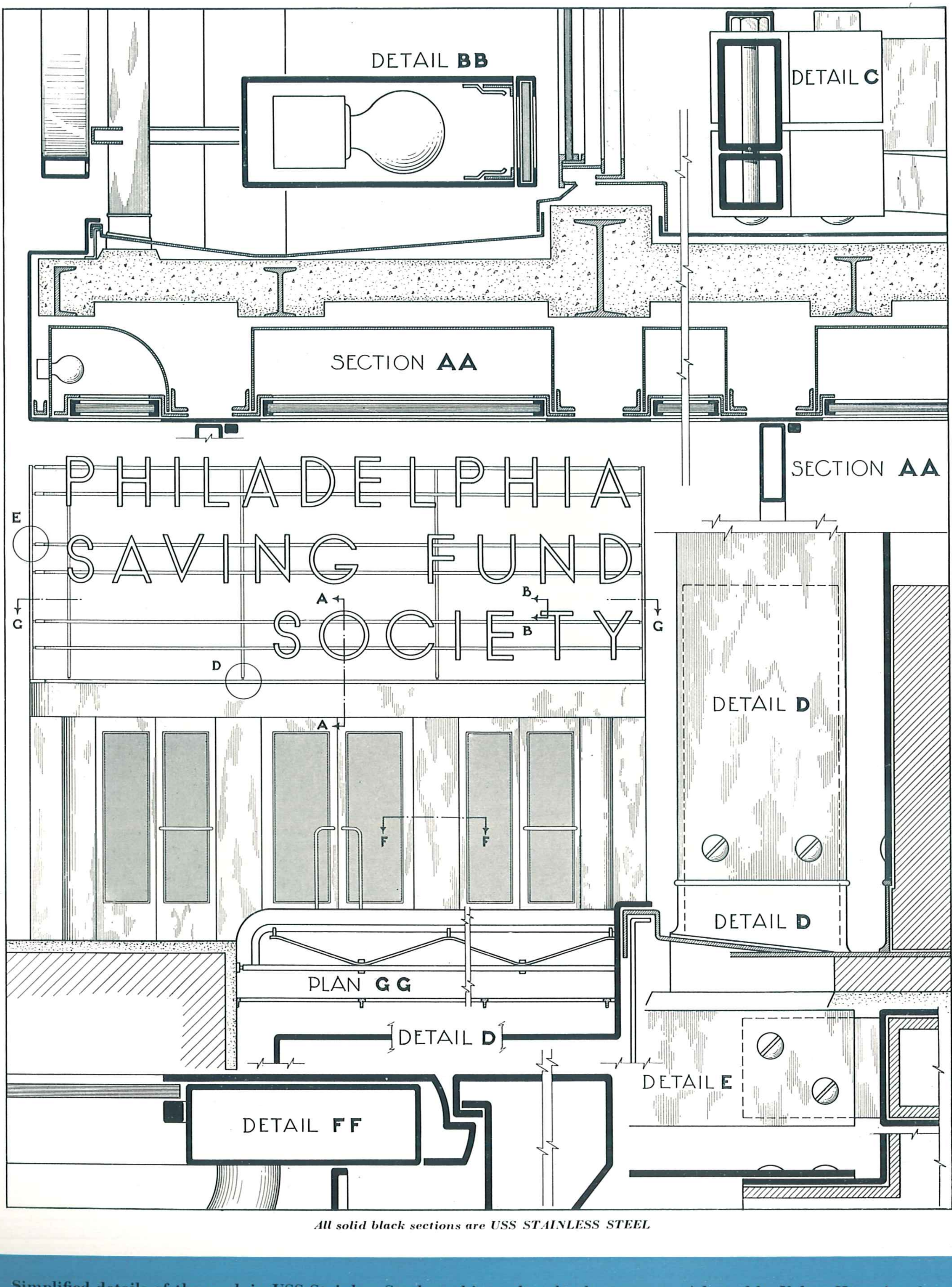
USS Stainless Steel hinges are so strong they will never wear and let their doors down. They eliminate all question of hinge replacement.



USS Stainless Steel kick plates and push plates are more economical in the end. They are so tough that they should far out-last your building.

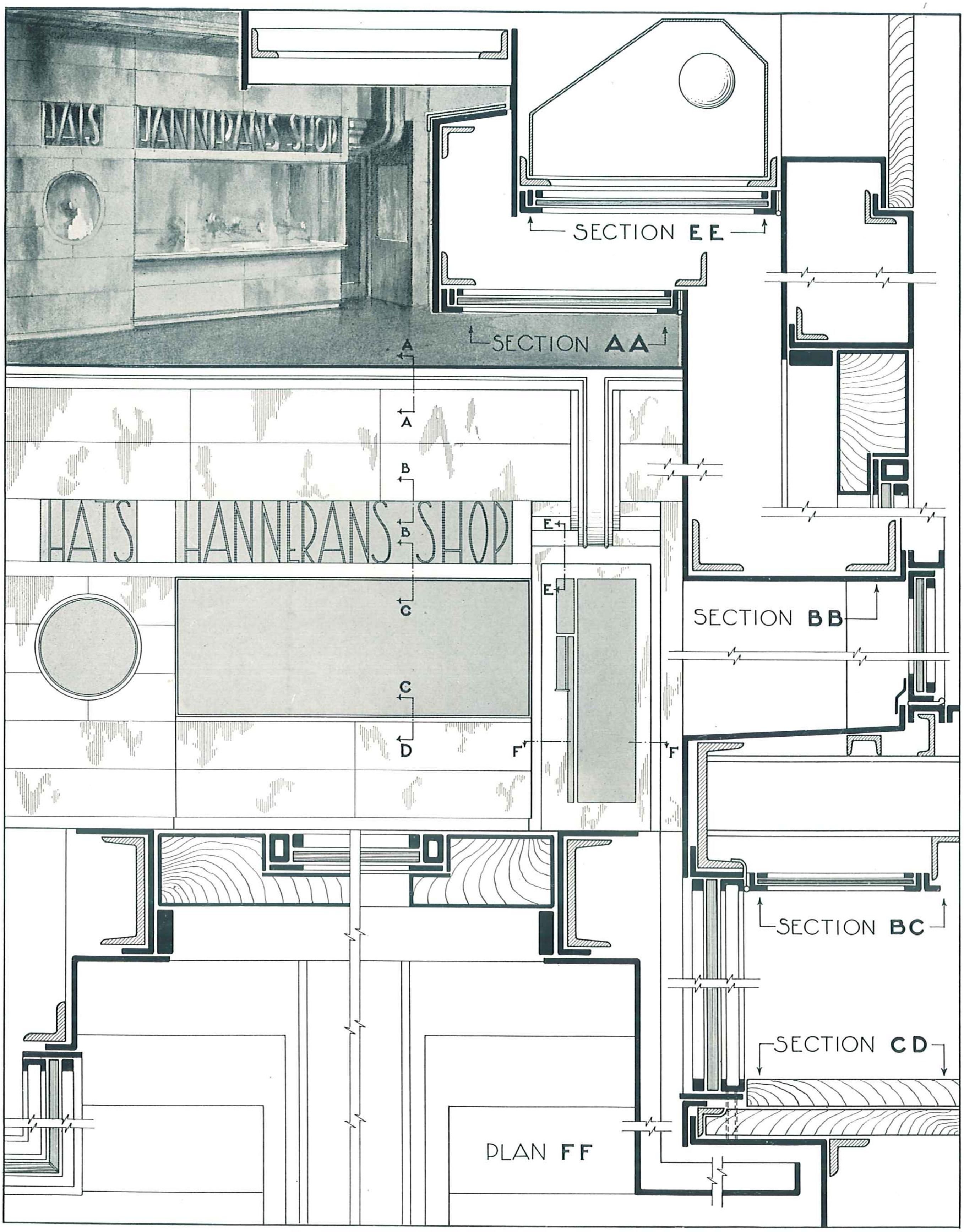


USS Stainless Steel is now the accepted metal for safe deposit vaults. It is clean, tarnish-proof, and two to four times as strong as ordinary steel.



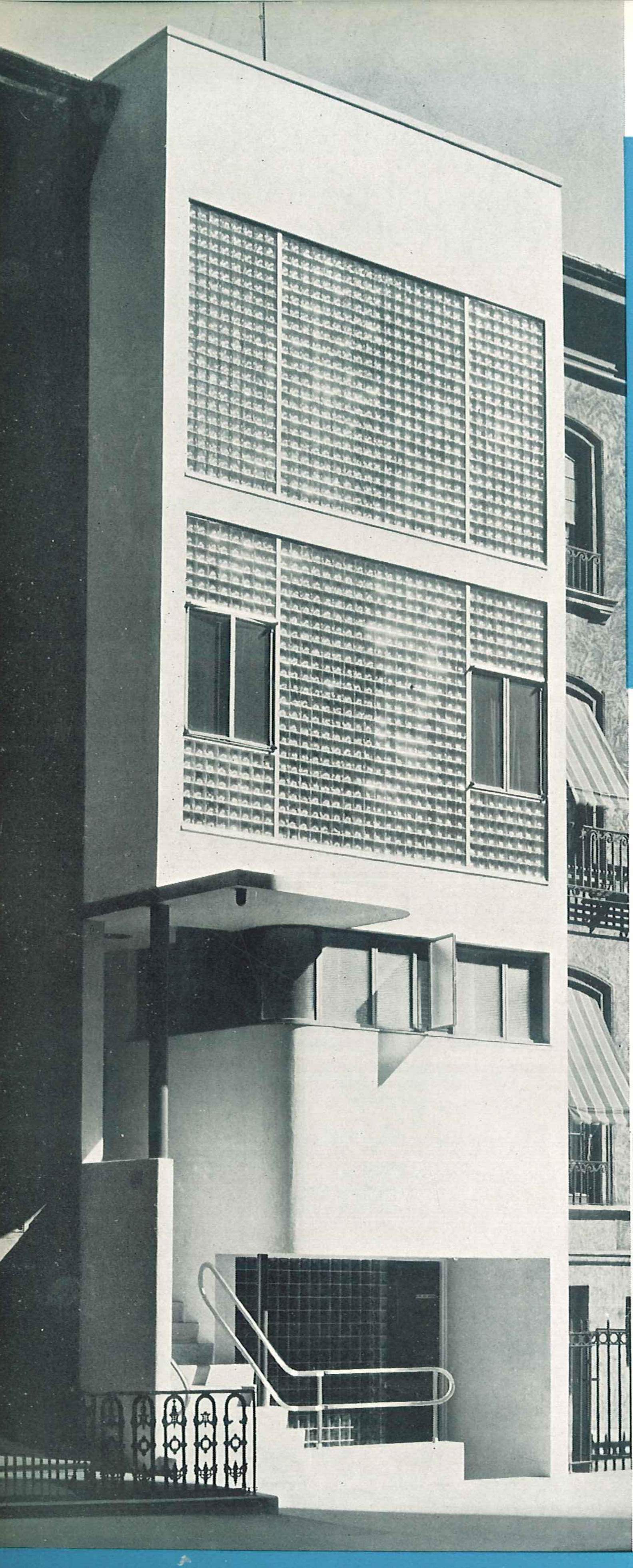
All solid black sections are USS STAINLESS STEEL

Simplified details of the work in USS Stainless Steel on this modern bank entrance. Adapted by Vahan Hagopian from Howe and Lescaze's original drawings. Fabricated by General Bronze Corporation. See photograph on front cover.



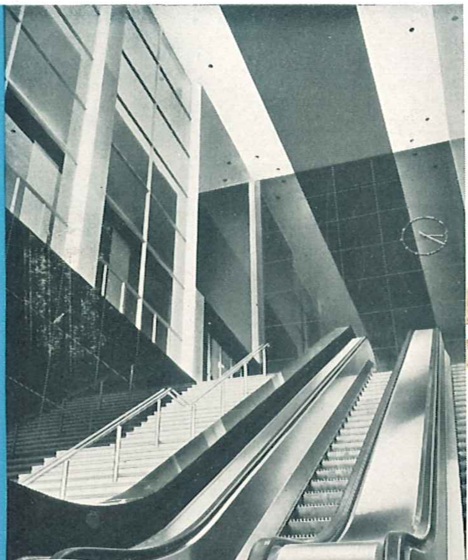
All solid black sections to be executed in USS STAINLESS STEEL

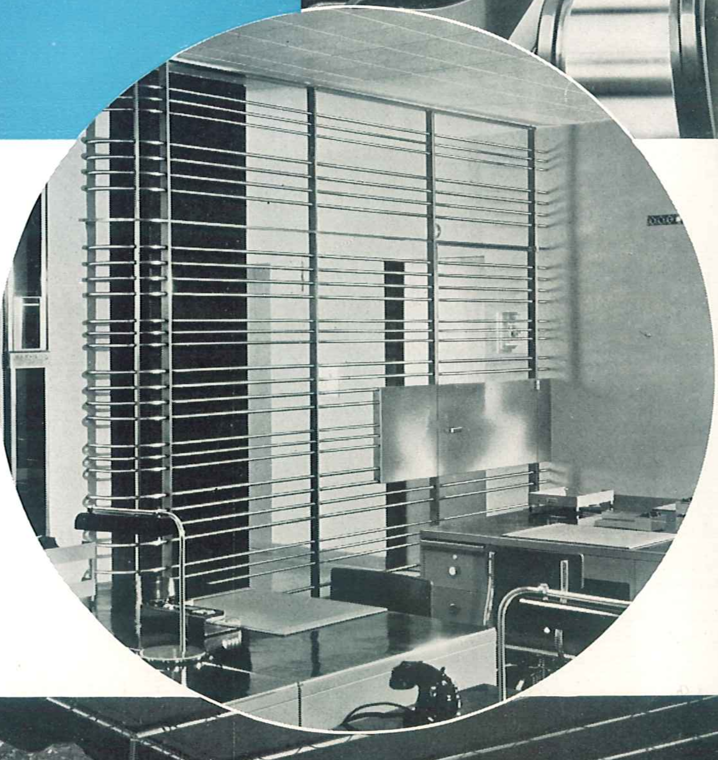
A proposed store front for a crowded metropolitan thoroughfare designed to invite "window shopping" and to attract traffic into the shop. Note the use of large exposed surfaces which USS Stainless Steel makes possible, and the unusual simplicity of construction. By Vahan Hagopian.

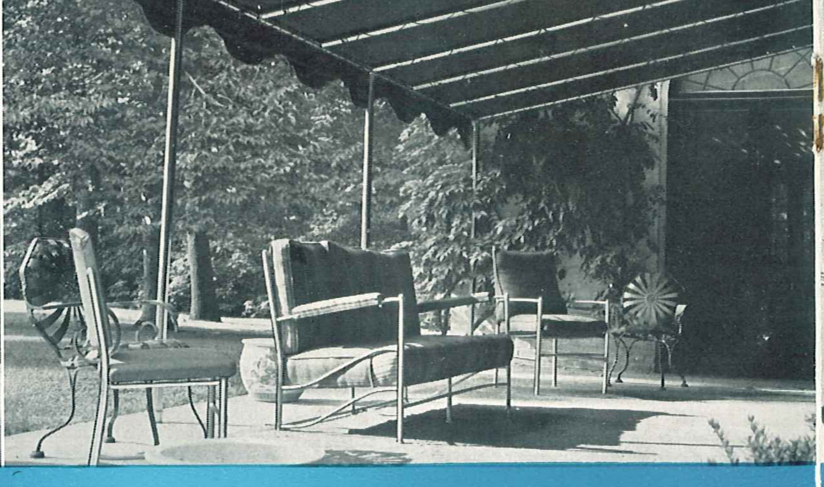


(Right)
USS Stainless Steel trimming and hand-rails play an important part in this interesting treatment of staircase and escalator in the PSFS Building.

(Below)
USS Stainless Steel is especially suited for this gate in the offices of the Philadelphia Saving Fund Society—it is not only highly decorative, but twice as strong as ordinary steel!



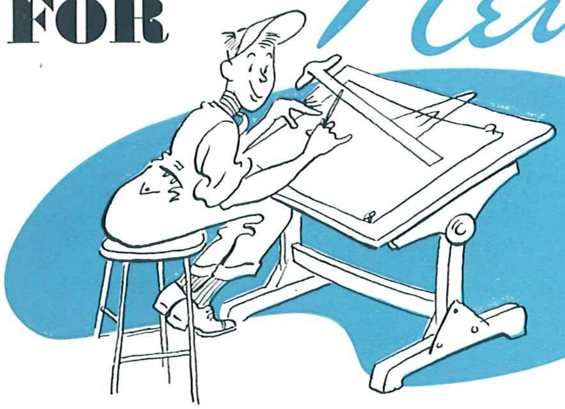




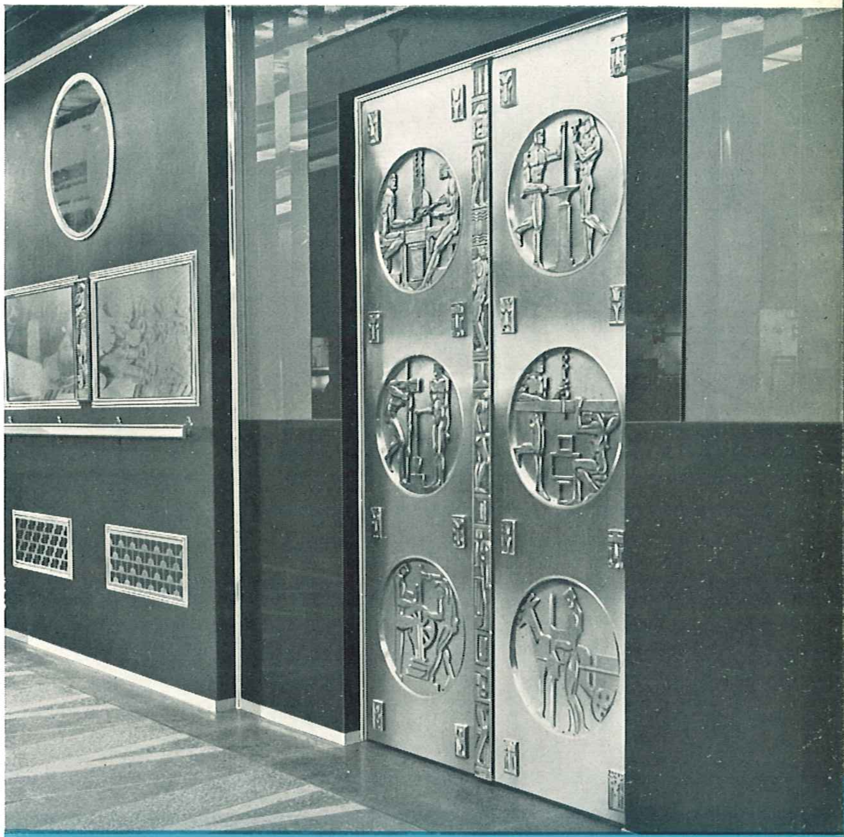
USS Stainless Steel (here used for hand-rail) is functionally correct for this house designed by William Lescaze because it is tarnish-proof, strong, especially adapted to simplified design.

Beauty and utility go hand-in-hand in this awning frame made of polished, seamless stainless tubing. The lacing is so designed that the brilliant rafters are visible from below.

FOR New Freedom IN MODERN DESIGN

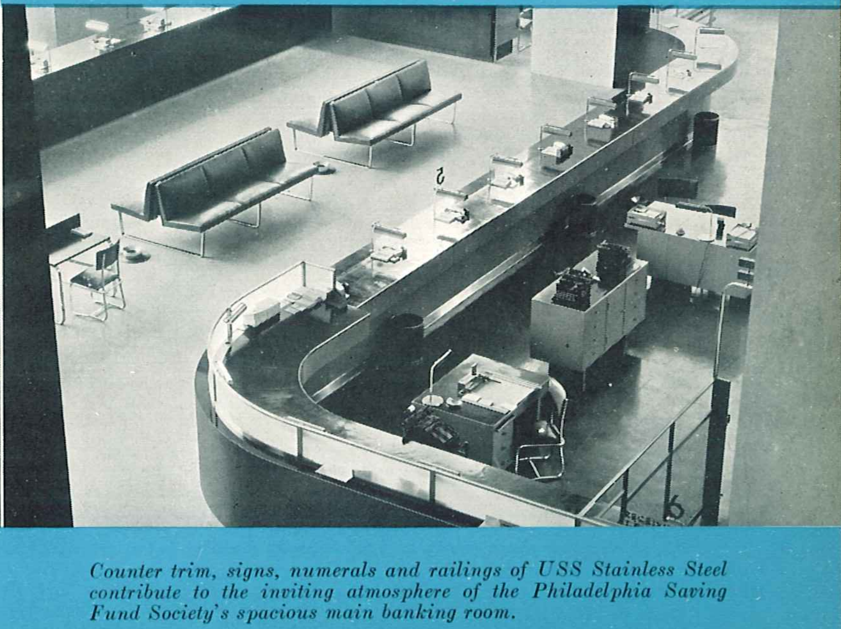


USS Stainless Steel gives the architect new freedom in the design of modern decoration and trimming. Consider these unique properties: (1) USS Stainless Steel is available in any finish from dull satin to mirror luster; (2) This new metal is so strong that its use in thin sections will materially lighten heavy canopies, marquees and hangings; (3) It is ideally suited for bright-metal towers, flag-poles, facades, marquees, etc., which are inaccessible for cleaning; (4) Stainless steel 18-8 is the only commercial metal which will keep your work as brilliant forever as the day it is installed.



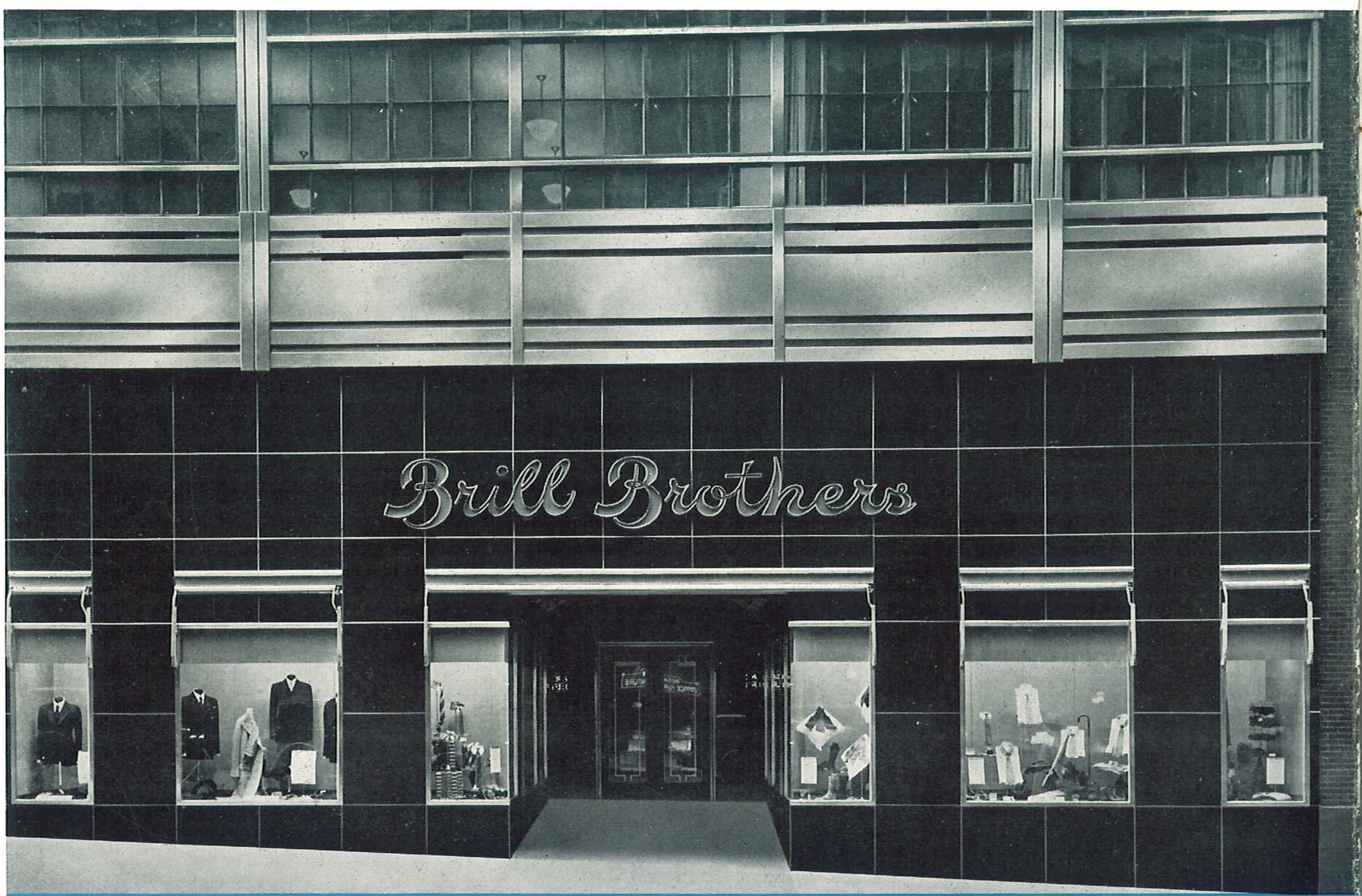
Sculpture in stainless steel—doors by Oscar Bach in the Permanent Exhibition of Stainless Steel in Washington. USS Stainless Steel may be etched, tooled, enameled to produce new beautiful effects.

Lustrous seamless tubing of USS Stainless Steel is the most suitable material for modern furniture. It is tarnish-proof, virtually scratch-proof, and so resilient that it can be used for springing.

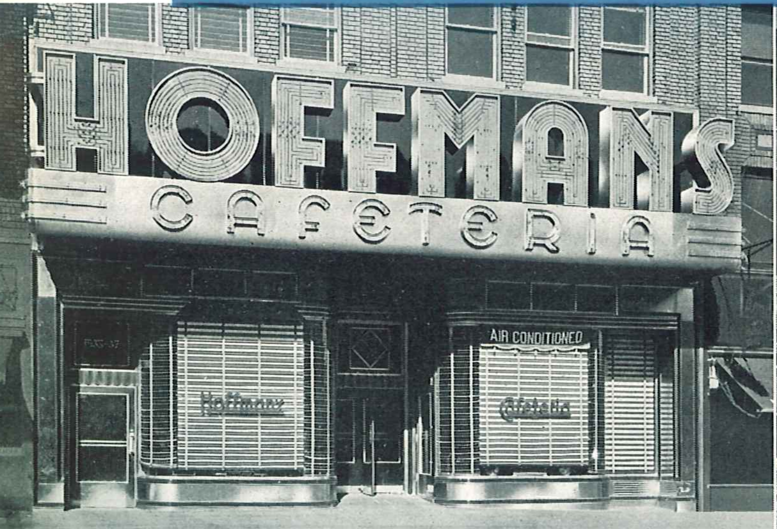


Counter trim, signs, numerals and railings of USS Stainless Steel contribute to the inviting atmosphere of the Philadelphia Saving Fund Society's spacious main banking room.

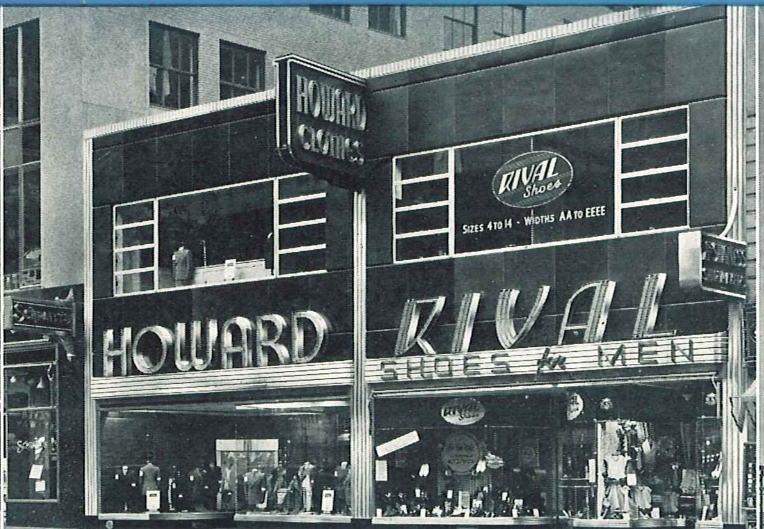
Attract CUSTOMERS for TENANTS



Stainless steel is the only metal entirely suited for trimming with structural glass because it is the only metal which, like glass, will stay permanently brilliant. Like glass, USS Stainless Steel needs only a simple wash with soap and water to remove surface soil, restore its original gleaming luster. The clean sparkle of USS Stainless suggests fresh, modern merchandise.



This New York cafeteria installed a brilliant prominent front of USS Stainless Steel for the reason they installed air conditioning . . . to attract more customers.



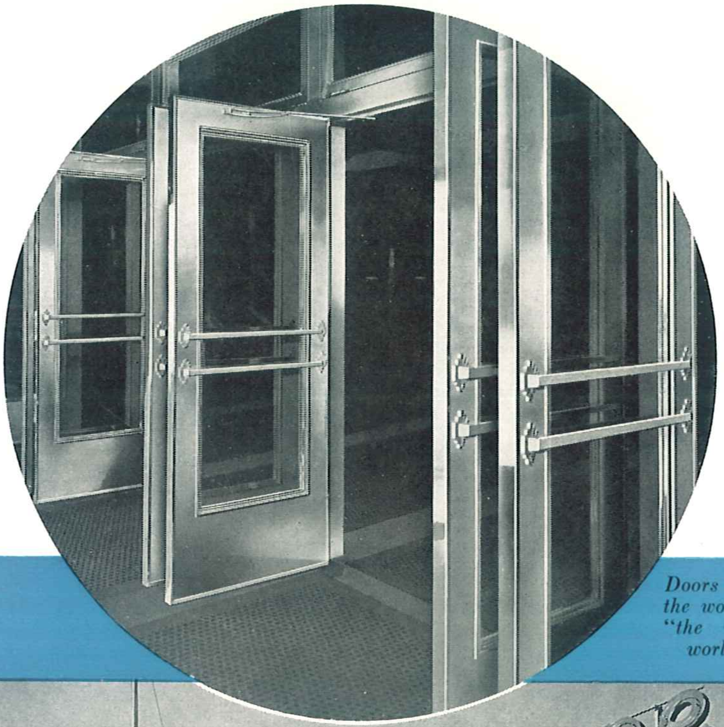
Two well known merchants have made extensive use of stainless steel in these store fronts. Traffic into their stores is so heavy that it was impossible to take this photograph on any day but Sunday.

. . . and TENANTS for OWNERS . . .

USS

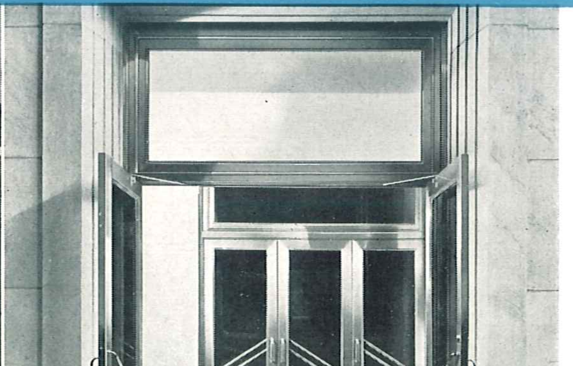
STAINLESS STEEL

for distinctive store fronts and entrances



Doors of "the most beautiful metal in the world" invite theatre-goers to see "the most beautiful girls in the world". The doors can never age.

This smart chain bakery makes a lot of its small location with an inviting front of USS Stainless Steel.

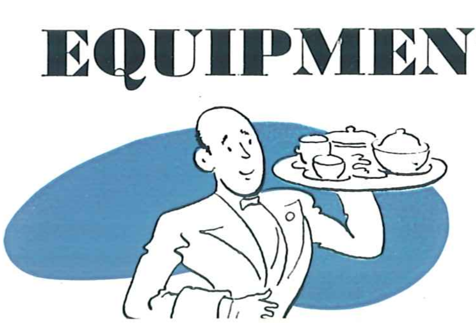


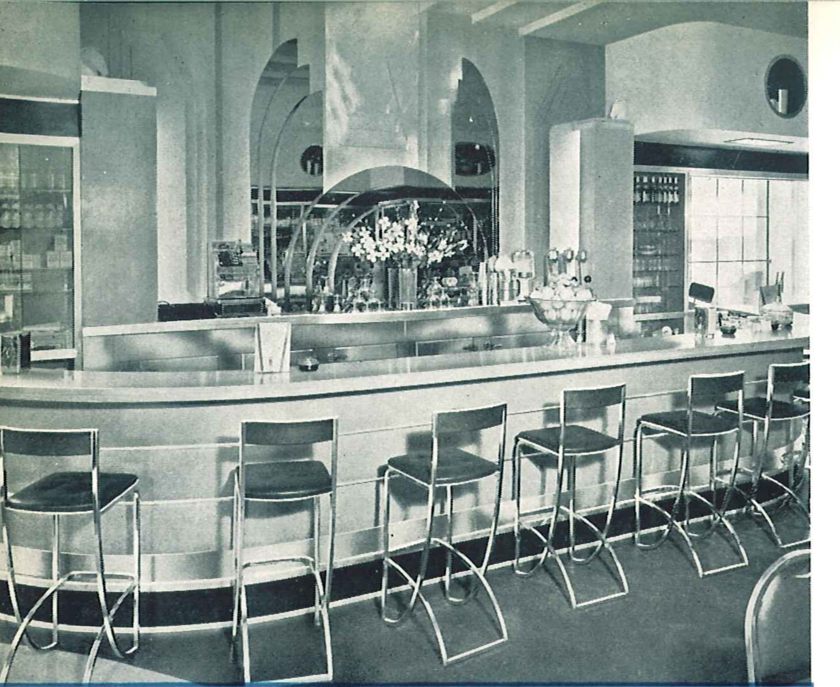
The pleasing simplicity of this remodeled entrance springs from the simple beauty of USS Stainless Steel surfaces.

Architecture comes to the waterfront—and even the pier front turns to stainless steel! The Normandie, which docks at this pier, also has stainless window frames in her winter garden which are impervious even to salt air.

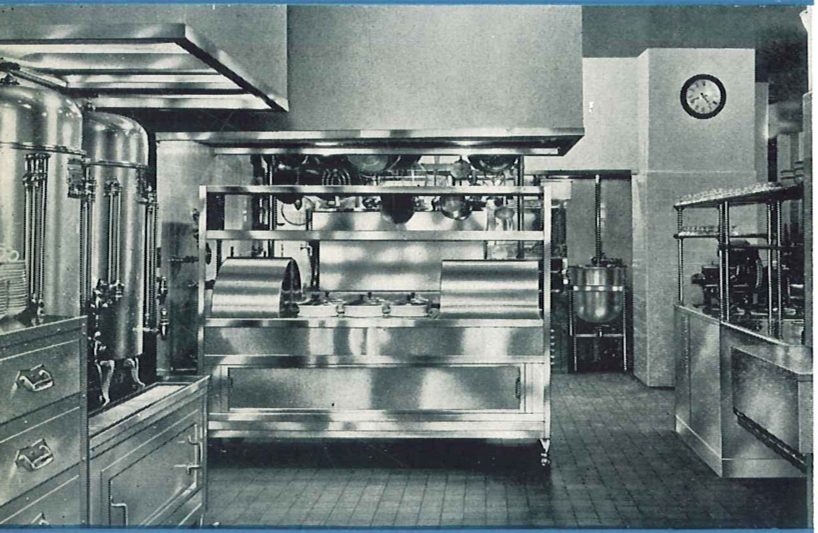
A NEW WAY TO *whet appetites..*

USS STAINLESS STEEL for RESTAURANT KITCHEN BAR AND FOUNTAIN EQUIPMENT

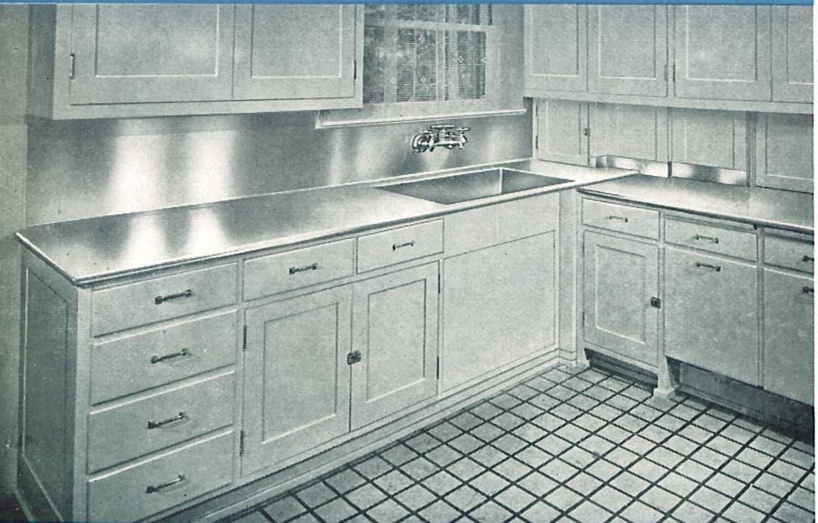




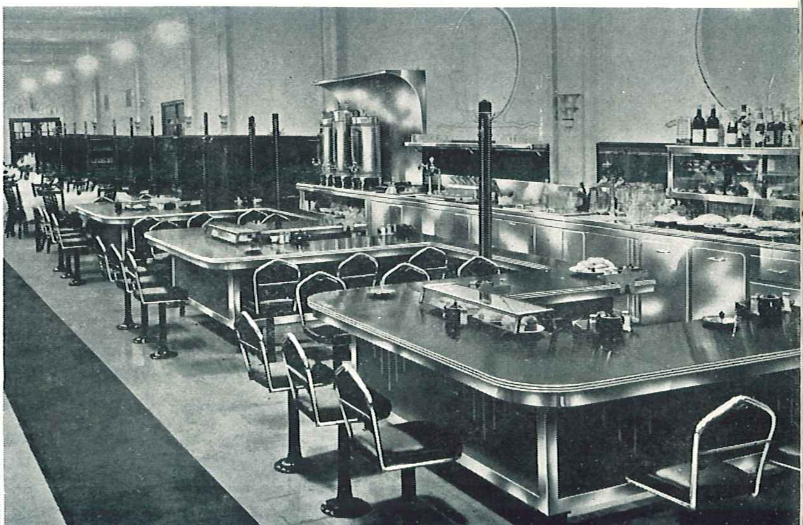
Sparkling chairs and fountain equipment of USS Stainless Steel harmonize excellently with the spacious accent of the staggered mirrors which conceal indirect neon lighting.



Can you imagine anything but excellent food and immaculate sanitation in this New York bank kitchen—completely equipped as it is with USS Stainless Steel?



Why should even unpretentious kitchens be equipped with sideboards, drainboards and sinks of USS Stainless Steel? Because stainless steel is the only metal which is immune to all food products, virtually wear-proof, permanently flat, everlastingly bright!



USS Stainless Steel was used here for counter trim, back bar, coolers, urn stand and cowl. Because it is so easy to clean and to keep clean, because it will last "forever", will cost less per year of use.

USS STAINLESS STEEL is available in these Standard Surface Finishes

Tube and sheet surface finishes on same horizontal line have approximately the same appearance.

For architectural applications, finishes 4, 6 and C are generally considered the best. Their rich satin luster is attractive, easy to clean, not easily marred. Finishes 7 and D have a high polish which is suitable where pronounced accent and brilliant luster are desirable. This high polish, however, is obviously more easily marred by scratching than satin finishes.

The other finishes are intermediate mill surfaces recommended where fabricating would damage one of the above finishes. In these cases, the final finish is applied in the fabricator's shop after fabrication.

It is not possible to illustrate these finishes adequately on the printed page. We shall, however, gladly send you samples on request.

Finish Designation	PIPE AND TUBES
0	Hot Rolled—Annealed—Not Pickled
1	Hot Rolled—Annealed—Pickled
2	Cold Drawn—Annealed—Pickled
2-A	Cold Drawn—Not Annealed—Pickled (Hard)
A	Standard Ground Finish (80 Grit)
B	Semi-Polished Finish (120 Grit)
C	Standard Polished Finish (180 Grit)
D	Mirror Polish—Very Finely Ground (320 Grit) and Buffed

Finish Designation	STRIP, SHEETS AND LIGHT PLATES
1	Hot Rolled—Annealed—Pickled
2-D	Full Cold Rolled—Annealed—Pickled—Dull Finish
2-B	Full Cold Rolled—Annealed—Pickled—Bright Finish
4	Standard Polish Finish
6	Standard Polished Finish—Tampico Brushed
7	Special Polished Finish—Buffed

U·S·S STAINLESS STEEL RESISTS MANY TYPES OF CORROSION

Data on resistance of USS Stainless Steel to many corrosive agents commonly encountered in architectural applications.

The following data are results of laboratory tests conducted by Fried Krupp A.G. Since actual service conditions are not always exactly duplicated in the laboratory, these data should be considered indicative rather than positive. Most important to architects is the fact that USS 18-8 is permanently immune to atmospheric corrosion, never pits nor tarnishes, looks "brand new" forever.

A—Fully resistant (less than .00035" penetration per mo.)
B—Satisfactorily resistant (less than .0035" penetration per mo.)
C—Fairly resistant (less than .010" penetration per mo.)
D—Slightly resistant (less than .035" penetration per mo.)
E—Not resistant (less than .35" penetration per mo.)

Substance	*Condition*	*Temp. F.*	*USS 18-8*	*USS 17*
Acetic Acid	5% Agitated	70°	A	A
	5% Aerated	70°	A	A
	20% Aerated	70°	A	A
Acetic Vapors 100%		Hot	E	..
Acetone		Boiling	A	..
Alcohol Ethyl		70°	A	A
		Boiling	A	A
Alcohol Methyl		70°	A	A
Ammonia				
All Concentrations		70°	A	A
Gas		Hot	D	D
Aniline 3%		70°	A	A
Beer			A	..
Benzene		70°	A	A
Benzol		Hot	A	A
Blood (Meat Juices)		Cold	*A	A
Buttermilk		70°	A	A
Butyric Acid 5%		70°	A	A
	5%	150°	A	A
Calcium Hydroxide	10%	Boiling	A	..
(Lime)	20%	Boiling	A	A
	50%	Boiling	C	..
Carbolic Acid	C.P.	Boiling	A	..
	Raw	Boiling	A	..
	C.P.	70°	A	A
Carbonated Water			A	A
Carbon Tetrachloride		70°	A	A
Aqueous Solution 5-10%		70°	*C	C
Cellulose			A	A
Chlorinated Water				
Saturated		70°	*C	D
Chloroform		70°	A	A
Chromium Plating Bath		70°	A	..
Cider		70°	A	A
Citric Acid	5% Still	70°	A	A
	5% Still	150°	A	A
	15%	70°	A	..
	15%	Boiling	B	A
	Concentrated	Boiling	C	..
Coca Cola Syrup (Pure)		70°	A	A
Coffee		Boiling	A	A
Creosote (Coal Tar)		Hot	A	..
Developing Solutions		70°	A	A
Dyewood Liquor		70°	‡A	..
Epsom Salt		Hot & Cold	A	A
Ether		70°	A	A
Fruit Juices		70°	A	A
Fuel Oil		Hot	A	..
Gasoline		70°	A	A
Glue—Dry		70°	A	A
Glycerine		70°	A	A
Hydrogen Sulphide	Dry		A	A
	Wet		‡B	B
Ink			‡B	..
Iodine			E	E
Kerosene		70°	A	A
Ketchup Still		150°	A	A
Lard		70°	A	A
Mayonnaise		70°	A	..
Milk Fresh or Sour		Hot or Cold	A	A
Mixed Acids				
53% H_2SO_4—45% HNO_3		Cold	B	B
Molasses			A	A
Mustard		70°	A	A
Nitric Acid	5% Solution	70°	A	A
	50% Solution	70°	A	A
	50% Solution	Boiling	A	A
	65% Solution	Boiling	D	D
Oils, Vegetable, Mineral		Hot & Cold	‡A	A
Paraffine		Hot & Cold	A	A
Rosin		Molten	A	A
Sea Water			*A	A
Sewage			‡A	..
Soap		70°	A	A
Sugar Juice			A	A
Tannic Acid		70°	A	A
Varnish		70°	A	..
Vegetable Juices			A	..
Vinegar		Hot	A	..

*Subject to pitting at air line or when allowed to dry.

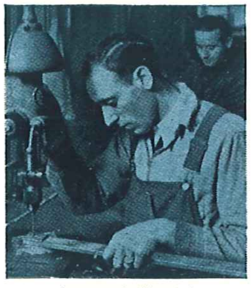
**Keep solutions alkaline.

‡May attack when sulphuric acid is present.

(More complete data in booklet "USS Stainless and Heat Resisting Steels in the Process Industries")

USS STAINLESS STEEL may be READILY FABRICATED by virtually every artifice of the metal worker

(FABRICATING DIRECTIONS FOR U·S·S 18-8)



. . . always drill with considerable pressure and a sharp tool.

ANNEALING. To anneal USS 18-8 Stainless Steel properly, the entire work should be heated to approximately 1950°F. and then cooled as rapidly as possible, preferably by quenching. This annealing eliminates any hardening or strain which previous cooled work may have caused, restores the stainless alloy to a completely austenitic structure of proper grain size—the structure of a maximum ductility, softness and corrosion-resistance.

SOLDERING. In spite of its highly impermeable surface, USS 18-8 may easily be soldered if the surface is thoroughly cleaned and etched with a suitable acid (e.g. muriatic acid and zinc chloride). Some little time should be allowed for thorough etching of polished surfaces and care should be taken not to spoil the surface beyond the zone to be soldered. Soldering, however, does not make a strong joint, and should ordinarily be used only to seal a joint secured by riveting or spot welding. 75% tin—25% lead solder is recommended because it discolors less rapidly. Stainless steel may be silver soldered, etc. with special hard solders available for this purpose from commercial suppliers.

. . . cut with a wavy set saw or an abrasive cutting wheel.

CUTTING OPERATIONS. USS 18-8 may be sawed, machined, drilled and threaded; but it is necessary to keep in mind that this metal is exceptionally strong and tough, and that it hardens quickly under cold work. For these reasons, the art of cutting USS 18-8 may be summed up by these recommendations: (1) reduce cutting speeds, (2) take heavy cuts, (3) use sharp high speed tools, and (4) a generous rake. In sawing, for example, the saw should be heavily weighted and so applied that the first stroke definitely cuts the metal. A wavy set saw is recommended. If the saw is allowed to ride over the work without deep cutting, the stainless steel will quickly work-harden and become more difficult to cut. It may be cut dry, or with lard oil-sulphur lubricant. Tools should be sharp and kept sharp. A moderate amount of heating will make the cutting even easier.

PASSIVATION. During fabrication operations, particles of base metals may become imbedded in the surface of stainless steel. These contaminating metals may, of course, corrode or discolor and give the false impression that the stainless steel itself is being corroded. Exposure for ten to fifteen minutes to 10-20% nitric acid (125-140°F.) will dissolve these particles and eliminate this potential source of trouble; it also passivates the surface of the stainless steel, giving it its highest degree of corrosion-resistance. Where dipping is impractical, the surface may be swabbed for five to ten minutes. The nitric acid treatment should always be followed by a thorough hot-water rinse.

PICKLING. For pickling USS 18-8 a hot solution (150°F) is recommended. Either a 50% solution of muriatic acid or a solution of 10% sulphuric acid with 10% common salt is a satisfactory cleaning agent. After pickling, the stainless steel should be well rinsed in hot water, passivated by a few minutes dip in 10-20% nitric acid (125-140°F.), and then given a thorough final hot water rinse.

. . . so ductile it can easily be formed into complicated shapes.

PUNCHING AND SHEARING. For best results the engaging parts employed for shearing and punching should engage more neatly and with less clearance than those used for ordinary steel. Clean edges are easily obtained if the punch completely penetrates the stock. The exceptional ductility of USS 18-8 may cause the metal to drag if these precautions are not observed.

RIVETING. USS 18-8 is well adapted to riveting, either hot or cold. Rivets up to ⅜″ may be driven cold; hot rivets should be heated out of contact with a flame to 2100°F. and be set before they cool below 1800°F.

FORGING. USS 18-8 is readily forged at 2250°F.-1800°F., although it forges more slowly and will require more hammer blows, owing to its unusually high strength at high temperatures. Heating requires a longer time than is allowed for ordinary steels. It is advisable to reheat if the work cools to 1600° before the forging is completed.

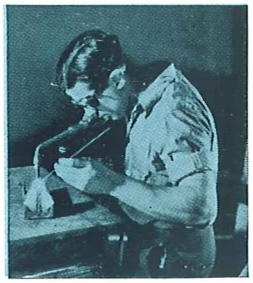
. . . polish or buff at slower speeds to any finish you desire.

POLISHING. Polishing technique will vary greatly with the contour of the surface and the type of finish desired. Silicon carbide and aluminum oxide type abrasives are the most suitable; coarser grits may be used dry, finer grits and buffing on a soft grease wheel with high-softening-point stearic-base grease. Abrasives must be iron free; otherwise the surface may be contaminated with iron compounds which will rust or discolor. Since high grinding speeds may roughen the surface of stainless steel, speeds during grinding should not exceed 8000 feet per minute; during buffing, 10,000 feet per minute. To avoid scorching, open, well-ventilated wheels should be used since stainless steels are poor conductors of heat.

SPINNING. Owing to its high ductility USS 18-8 is well adapted to spinning but will, of course, require more power. Large radius spinning tools and slower speeds are advisable. If the stock becomes excessively work-hardened before the desired deformation is obtained, it should be thoroughly cleaned, annealed at 1950°F. and quickly cooled in the air or by a water quench. The entire stock should be raised to the indicated temperature. This treatment will restore the stainless alloy to its original soft, ductile condition.

WELDING. USS 18-8 is well adapted to welding by electric resistance, electric arc, acetylene or atomic hydrogen methods; it cannot be hammer welded satisfactorily.

Surfaces should be thoroughly cleaned; in gas welding the flame should be as small as possible and practically neutral (reducing flames contain carbon, oxidizing flames may cause excessive slag), and it should be directed toward the unfinished work to avoid excessive heating. In electric welding the work should be negative; a current of about 60 amperes at 35 volts (open circuit) is generally satisfactory for a $\frac{7}{32}''$ rod, the current increasing with the rod diameter.


. . . easily and neatly welded.

After welding, the bead should be ground flush with the surface and all oxide or discoloration adjacent to the weld removed.

PHYSICAL PROPERTIES OF USS STAINLESS STEEL FOR ARCHITECTURAL USES

Metal annealed, unless otherwise noted
Data compiled by Research Laboratory, United States Steel Corporation

ITEM No.	Physical Properties	USS 18-8		USS 17	
	Specific Gravity				
1	lb./cu. in.	0.286		0.273	
2	*low carbon steel = 1.00*	*1.01*		*0.96*	
	Specific Electrical Resistance at 68°F.				
3	microhms/cm.³	70 (cold worked = 70–82)		59	
4	microhms/in.³	27.6 (cold worked = 27.6–32.3)		23.2	
5	*low carbon steel = 1.00*	*6.4*		*5.4*	
6	Melting Range, °F.	2550–2590		2710–2750	
7	Structure	Austenitic		Ferritic	
	Magnetic Permeability				
8	as annealed	$u = 1.003$		Ferromagnetic	
9	after 10% reduction of area	$u = 1.10$		Ferromagnetic	
	Specific Heat				
10	cal./°C./gm. (0 to 100°C.)	0.12		0.11	
11	B.t.u./°F./lb. (32 to 212°F.)	0.12		0.11	
12	*low carbon steel = 1.00 (0 to 100°C.)*	*1.1*		*1.0*	
	Thermal Conductivity				
13	cal./cm.²/sec./°C./cm., at 100°C.	0.0390		0.0583	
14	B.t.u./sq. ft./hr./°F./in., at 212°F.	113		169	
15	*low carbon steel = 1.00, at 100°C.*	*0.33*		*0.49*	
16	cal./cm.²/sec./°C./cm., at 500°C.	0.0515		0.0624	
17	B.t.u./sq. ft./hr./°F./in., at 932°F.	150		181	
	Coefficient of Thermal Expansion				
18	per °F. × 10^{-6} (32 to 212°F.)	9.6		6.0	
19	*low carbon steel = 1.00 (32 to 212°F.)*	*1.45*		*0.91*	
20	per °F. × 10^{-6} (32 to 932°F.)	10.2		6.7	
	Mechanical Properties at Room Temperature	Annealed	Cold Worked	Annealed	Cold Worked
21	Tensile Strength, 10^3 lb./sq. in.	80–95	105–300	75	100–190
22	Yield Point, 10^3 lb./sq. in.	35–45	60–250	40	....
23	Modulus of Elasticity, 10^6 lb./sq. in.	29	....	29	....
24	Elongation in 2 in., %	55–60	50–2 (10″)	27	25–2 (10″)
25	Reduction of Area, %	55–65	65–30	55	40–20
26	Charpy Impact Strength, ft.-lb.	.....	.....	..	.....
27	Izod Impact Strength, ft.-lb.	75–110	.....	8–25	.....
28	Endurance Limit (Fatigue), 10^3 lb./sq. in.	35	94	50	.....
29	Brinell Hardness Number	135–185	170–460	175	185–270
30	Rockwell Hardness Number	B75–90	C5–47	B85	B90–105
31	Erichsen Value, mm.	11–14	....	7–9	....
	Stress Causing 1% Elongation (Creep) in 10,000 Hours				
32	At 1000°F., lb./sq. in.	17000		8500	
33	At 1200°F., lb./sq. in.	7000		2100	
34	At 1350°F., lb./sq. in.	3000		1200	
35	At 1500°F., lb./sq. in.	850		....	
36	Scaling Temperature, °F. (approximate)	1650		1550	
37	Initial Forging Temperature, °F.	2200		2000	
38	Finishing Temperature, °F.	Not under 1600–1700		Not over 1400	
39	Annealing Treatment	Heat to 1900–2000°F. and quench		(A)	
40	Precautions	(B)		(D)	

(A) Anneal at 1400°F. after a small cold reduction, and quench.

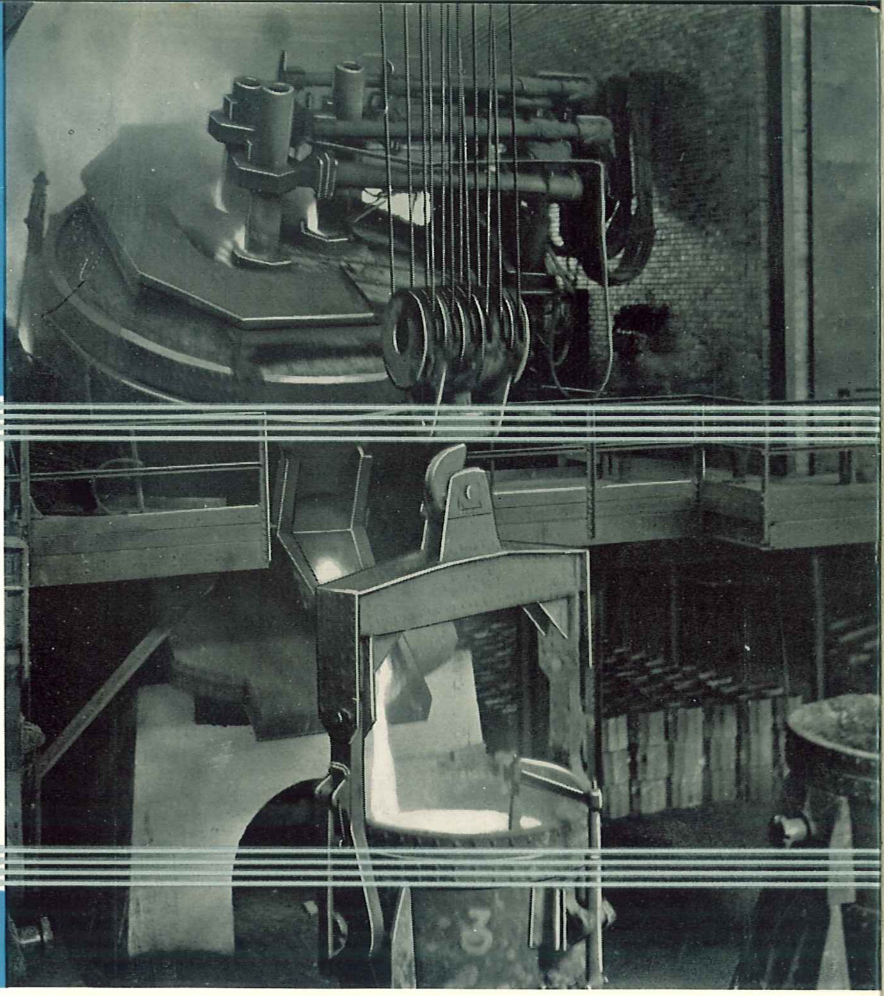
(B) Preheat slowly to 1600°F., then heat rapidly to the forging or annealing temperature. Exposure to temperatures between 1000 and 1500°F. produces marked susceptibility to intergranular corrosion. If the metal is unattacked, this can be cured by repeating the annealing treatment.

(C) Preheat slowly to 1450°F., then heat rapidly to 2100°F. for forging. Full corrosion resistance is developed only in the heat treated condition. (Temper below 1000°F.)

(D) In forging, preheat slowly to 1450°F. Excessive grain growth takes place above 2000°F. Expert welding is required to avoid excessive grain growth. Prolonged exposure at 850 to 950°F. produces cold brittleness. To prevent this, heat to 1400°F. before cooling, and quench.

ANNEALED UNLESS OTHERWISE NOTED. DATA COMPILED BY RESEARCH LABORATORY, UNITED STATES STEEL CORPORATION

USS Stainless Steel is a precision product, made only in giant electric furnaces where composition and temperature can be held within close tolerances. To insure absolute uniformity and unsurpassed quality, all the USS Stainless Steel sold by the various Subsidiary Companies of United States Steel Corporation is melted in one mill, exclusively devoted to the production of high grade alloys, by men who make nothing else.



WHENEVER you use Stainless Steel . . . it is to your advantage to specify USS

"USS" identifies stainless steel of the finest quality, made by the world's largest producer of high-grade steels. Here are three important, tangible reasons why it is to your advantage to make certain that whenever you buy or use stainless steel . . . you get "USS".

The *metal* is most important. The remarkable properties of stainless steel depend on accurate composition and skillful heat treatment. Thanks to precision control, specialized equipment and skilled men who work on nothing but stainless steel, you have the greatest assurance that your stainless will never tarnish if you specify "USS".

Availability is important, too. USS Stainless Steel is available in every needed analysis; in the widest variety of shapes and forms and modifications; in warehouse stocks in principal cities for immediate delivery.

And so is our *consulting service* important, for we offer you whatever technical cooperation and assistance you may need. You will find a stainless steel specialist in our principal district offices. He in turn is supported by a Stainless Steel Department at the headquarters of each subsidiary selling USS Stainless Steel, where the very finest in research and laboratory equipment are ready to study your problem if the answer is not already known. From their wide experience, these men can often suggest valuable new ideas from other fields—ideas which may help you execute a better job at a lower cost. You are invited to discuss your problems freely with them, with no obligation.

We suggest that it is to your advantage to specify "USS". After all, it is only natural that the world's largest producer of high grade steels should be the most advantageous source for stainless steel.

AMERICAN STEEL & WIRE COMPANY
Chicago—New York

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh—Chicago

NATIONAL TUBE COMPANY
Pittsburgh

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